of water spider; 7, dirt; 8, daphne claws; 9, epithelium, animal and vegetable; 10, gromia; 11, gemiasma; 12, humus; 13, linen fiber; 14, potato starch; 15, pelomyxa; 16, parenchyma of leaf; 17, portion of a red water fungus; 18, piece of a red cranberry skin; 19, protococcus, probably gemiasma; 20, silica; 21, silk fiber; 22, vegetable hair; 23, wheat starch; 24, wheat gluten cells; 25, yeast. Ten of these objects come from water.

FOURTH EXAMINATION.

G. B. Harriman, D.D.S., of Boston, Mass., my associate, reports as found in the melted water of one cake of ice, Boston Highlands: 1, acanthodiniuin, with clusters of twelve spiral cells separated in all directions; 2, botridium cells; 3, closterium; 4, chlorococcus; 5, cotton fiber; 6, cryptomonas lenticularis; 7, claws of insects; 8, decaying leaves; 9, dust and excrementitious matters; 10, difflugia, dead, several varieties; 11, daphne claws; 12, epithelial scales, human; 13, fish scales, 14, fungi and spores; 15, humus; 16, hairs of various animals; 17, linen fiber; 18, large masses of decaying vegetable substances; 19, navicula; 20, nebalia; 21, peridinium cinctum; 22, peredinium spiniferum; 23, starch; 24, vorticella, two joined together; 25, wood fiber of various kinds; 26, yeast.

FIFTH EXAMINATION.

Ice from Amherst, Mass., furnished by Mr. C. H. Kellogg. Specimen taken from his cream cooler, and thoroughly washed. This showed but little morphological impurity beyond epithelia, animal and vegetable. From statements made by Mr. Kellogg, this ice was probably chemically contaminated by a paper mill.

SIXTH EXAMINATION.

Ice from Horn Pond, Woburn, Mass. This presented considerable lightish colored deposit, in which a few animal and vegetable forms were found, but was mainly made up of epithelia and amorphous dirt. The result was unexpected, as unfiltered Horn Pond water is rich in forms of life.

SEVENTH EXAMINATION.

Ice from New Haven, Conn. This specimen was quite free from forms of life.

EIGHTH EXAMINATION.

Ice from a provision store, July 13. 1, Amœba, alive; 2, bacteria; 3, cœlastrum sphericum; 4, chlorococcus; 5, diatoma vulgaris; 6, epithelia; 7, linen fiber; 8, monads; 9, monostylus aneurœa; 10, mass of carbon; 11, nostoc; 12, one gonidia of cœlastrum sphericum; 13, protococcus; 14, scenedesmus obliquus; 15, scenedesmus quadricauda; 16, starch grain; 17, staurastrum; 18, tabellaria; 19, tetrospore; 20, trachelomonas; 21, vegetable epithelium collection; 22, young closterium.

FIGURE 2.

Forms found in ice used in New York. Drawn by Dr. A. T. Cuzner, Peekskill.

a. Tabellaria.—A diatom found commonly in all surface drinking water. They have the power to arrange in rows, and the specimen in the cut has fifteen individuals in one aggregation, which is a small one. Diatoms are regarded as plants by the majority of observers. A good deal of difficulty arises from trying to measure things with the lines and plummets of past time, when the things in question were absolutely unknown, and hence could not be properly named at the date when the word "plant" was invented. As knowledge increases names must be changed. The diatoms are generally regarded as innocent, though some observers take the opposite ground.

b. Epithelia. These are probably human, washed into the water and frozen into the ice. They are constantly thrown off in washing, sputa, and the excretions of the body. They are also found on all other vertebrate animals and on vegetables.

c. Is spiral tissue from some leaf, probably.

d. Is a gromia—a rhizopod—animal.

e. Is potato starch more highly magnified than in Fig. 1. It is somewhat remarkable how long a time starch will exist unchanged in shape and form in pond waters.

f. Wheat starch cooked.

g. Wheat starch uncooked.

h. corn starch.

i. Yeast.

j. Bacilli, vibriones, bacteria.

k. Astrionella formosa.

l. Monad.

m. Three algæ ranged side by side, green chlorophyl collected at extremities.

n. Chitin.

o. Sporangia fungus.

p and *q.* Pelomyxas.

FIGURE 3.—(CUZNER).

Forms found in ice water, New York.

a, a'. Carapaces of entomostraca.

b. Tegument of wheat.

c. Synhedra, a diatom.

d. Mass of dirt, *débris*, etc.

e. Leaf of moss.

The other objects are portions of decayed leaves.

FIGURE 4.—(CUZNER).

One inch objective. Ice water forms.

d. Portion of limb from a water spider.

e. A sphagnum leaf entire.

f. Portion of another sphagnum (moss), leaf with reticulation shown.

g. Spined vegetable tissue.

FIGURE 5.

Portion of tree leaf with parenchymatous chlorophyl. This was drawn from a solar projection by Dr. Cuzner. It shows how the process of decay was averted by freezing.

FIGURE 6.—(CUZNER).

Mycelial filaments of a vinegar yeast found in connection with melting ice. At the bottom are the embryonal spores of the yeast.

This shows what happens when ice water is allowed to stand exposed to the action of the air. A long, dirty, grayish, gelatinous ribbon, half an inch wide and about one-eighth inch thick, appeared to be a mass of what is called "the mother of vinegar." The cut gives the appearances under the microscope. The significance shows what is the full development of some of the embryonal forms of life found in ice water when subjected to conditions that are present in refrigerators.

FIGURE 7.—(CUZNER).

Forms from Boston ice. (Not from Dr. Harriman's specimen.)

a. Epilobium montanum—pollen.

b. Diatom.

c. Melosira.

d. Pavement epithelia. Five specimens.

e. Diatom vulgare.

f. Starch.

g. Alcohol yeast

h. Protococcus.

i. Scenedesmus quadricauda.

j. Parenchyma of wheat.

The numerous objects in this field are monads that developed in large numbers in the specimen kept for a few days, as might be expected.

FIGURE 8.—(CUZNER).

Objects found in ice water.

a. Cotton fiber.

b. Silk fibers.

c. Bast fiber frayed by maceration.

d. Wool.

e. Pelomyxa.

f. Starch. (This is common.)

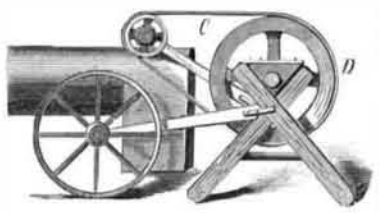
g. Epithelia pavement.

h, i. Curious algæ, sometimes crooked like an oxhorn, allied to ankistrodesmus falcatus.

MECHANICAL INVENTIONS.

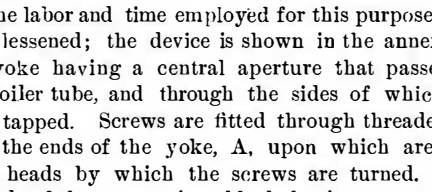
Motor and Thrasher Connection.

We give an engraving of a novel device for connecting motors and thrashers, which consists of a jack, tumbling rod, and belt, so arranged that the motor may be placed at any desired distance from the thrasher and a short belt may be used. C is a jack formed of two X-shaped side frames connected by rounds, and having bearings secured in their upper angles in which the journals of the wheel, D, revolve. Around this wheel passes a belt which also passes around the band wheel of the engine. The jack is supported against the pull of the belt by two braces, the ends of which rest in the side angles of the frame. The outer end of one of the braces rests against the bearings of the band wheel, and the outer end of the other rests against the rear wheel of the engine. These braces form all the support that the jack needs. One of the journals of the wheel, D, projects toward and is squared to fit into the square socket of a tumbling rod, that is connected at its other end to the journal of a thrashing cylinder. This device has been patented by Mr. Cyrus Stine, of McVeytown, Pa.



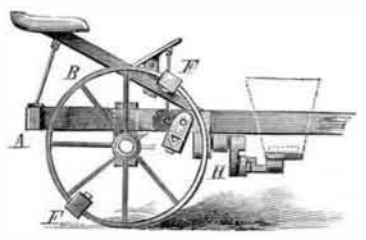
Apparatus for Drawing and Replacing Boiler Tubes.

The removal of a defective flue from a boiler is a laborious operation when the appliances generally employed are used. Messrs. Lorenzo W. Denney and Albert C. Johnson, of Wilmington, Del., have lately patented a device by which the labor and time employed for this purpose are materially lessened; the device is shown in the annexed cut. A is a yoke having a central aperture that passes freely over a boiler tube, and through the sides of which a set screw is tapped. Screws are fitted through threaded apertures in the ends of the yoke, A, upon which are formed squared heads by which the screws are turned. At the lower ends of the screws is a block having a central aperture corresponding to the aperture in yoke, A, and is formed with steps for receiving the ends of the screws. A starting plug that enters the tubes and has a shoulder to take against their ends, also has a hole at its smaller end for connecting a chain that will pass through the tube and be secured to the yoke, A. In use the block at the end of the screws is placed against the boiler head, with its aperture over the tube to be drawn, a chain from the yoke, A, is passed through the tube and secured to the starting plug, and the screws being turned, the tube is started, and when it is drawn far enough to receive the yoke, A, the chain and plug are removed and the yoke clamped to the tube by the set screw, and the screws operated as before. This operation is reversed to replace a tube.



Seed Planter.

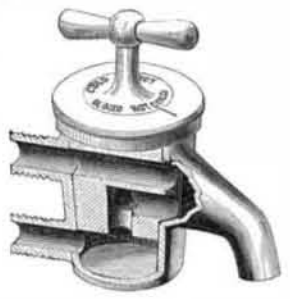
Mr. John W. Bunch, of Commercial Point, O., has patented a simple and effective mechanism for operating the seed dropping slide of a planter from the transporting wheels, and also to hold the wheels from revolving when turning and when adjusting the machine to bring the cross rows in line. In the accompanying cut, A is the frame of an ordinary seed planter, and B the transporting wheels, which are rigidly secured to the axle of the planter, the wheels carrying the axle in their revolution. The axle revolves in bearings in blocks adjustably secured to the side bars of the frame, A, by bolts. To the rim of each wheel are firmly attached directly opposite to each other, blocks, F, that are designed to mark the hills and operate the seed dropping mechanism. The inner end of one block of each wheel is rounded and secured to the wheels in such positions that when the block with a rounded end of one wheel is in contact with the ground the corresponding block of the other wheel will be at its top. To the lower side of a cross bar of the frame, A, is pivoted a bar, on the ends of which are cranks, H. The rear arms of the cranks are in such positions that they will be struck successively by the rounded ends of the blocks, F. The forward ends of the cranks are connected in such a manner to the seed dropping slide by this construction that when they are struck successively by the rounded blocks, F, the dropping slide will be moved so that seed will be dropped at each half revolution of the wheels. By a lever under the control of the driver, the wheels are prevented from revolving when turning around at the ends of the rows.



MISCELLANEOUS INVENTIONS.

Hot and Cold Water Faucet.

Mr. John H. Seabury, of Hempstead, N. Y., has recently patented a simple and efficient water faucet, from which hot or cold water may be drawn separately, or both may be drawn at the same time. The barrel of the faucet is made tapering, to form a seat for the plug, which is held in the ordinary way. The plug has the usual handle, and has also a dial on the plug for indicating the character of the water discharged, that is, hot, cold, hot and cold, and for indicating when the faucet is closed. The barrel is provided at one side with inlet openings for hot and cold water, that are connected respectively with suitable supply pipes, and at the opposite side is an elongated general delivery passage to the inner end of the discharge nozzle, which is correspondingly elongated. The plug is made with a transverse passage through it to connect the cold water inlet with the nozzle, and it also has a passage having three terminal openings that correspond with marks on the dial for the hot water. This faucet is readily operated to deliver either hot or cold water, or both at a time, and with the taper form of the plug and its seat, may readily be kept tight, and the passages in the plug being mainly transverse are easily made.



Billiard Cue Cutter.

Mr. Patrick Ryan, of New York city, has patented a new device for making a true cut on the ends of billiard cues. In the accompanying engraving A, is a sleeve provided with a clamping screw, and it also has a flange on its forward end. B is a stock that is swiveled to the sleeve and carries a hinged knife, and a recess in front of the opening in the sleeve, A, forms a continuous passage through the shell to the outer edge of the stock. D is a knife-arm secured upon the stock and channeled to inclose the neck of the shell. The upward movement of the knife-arm is limited by a stop, and the face of the block is made square and forms an abutment and guide, so that the knife will always move in a plane exactly at right angles to the sleeve, A, in which the cue is placed and securely held for trimming.